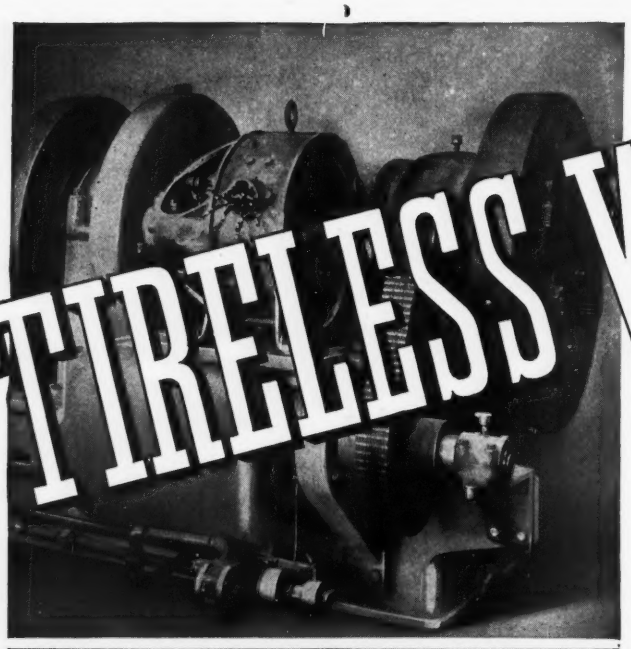
Bureau of Standards
Aug 5 1937

The CORNELL ENGINEER

In This Issue:

TRAFFIC LIGHTS *By Herbert Ashton, C.E., '12*

Volume 2 DECEMBER, 1936 Number 3



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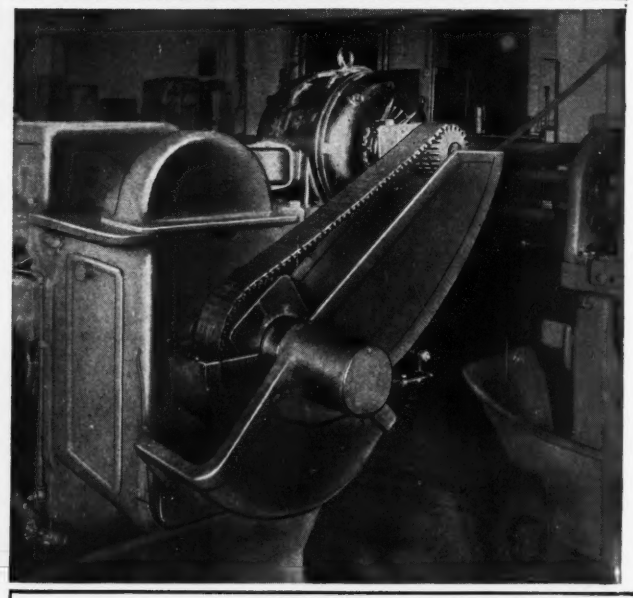

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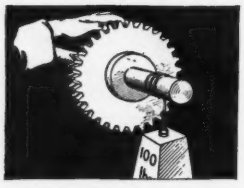

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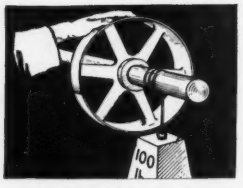

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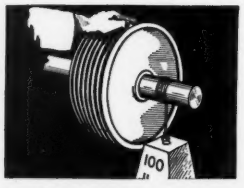

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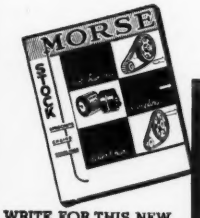

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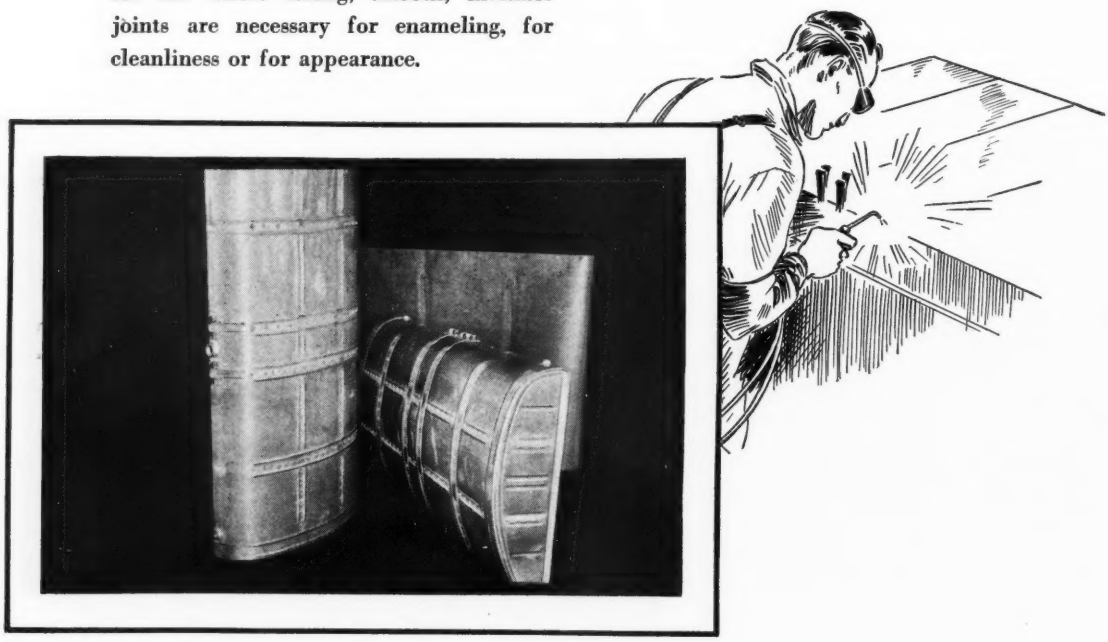

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THE CORNELL ENGINEER

PUBLISHED MONTHLY DURING THE COLLEGE YEAR

Volume 2 | DECEMBER, 1936 | Number 3

COMMENTS

To those who have always been puzzled just how traffic lights are controlled, Dr. Herbert Ashton's article is very interesting. The author points out the principles that are used in the design of traffic systems for large cities.

In this issue appears another student written article. It has been a long time since student articles have appeared in the ENGINEER, and Schlenker's article is an interesting one with which to renew the old policy. Norm spent a goodly portion of last summer working for the United States Geological Survey in Shenandoah National Park. Here he spent considerable time in the laying out of a system to supply drinking water for the rapidly growing park.

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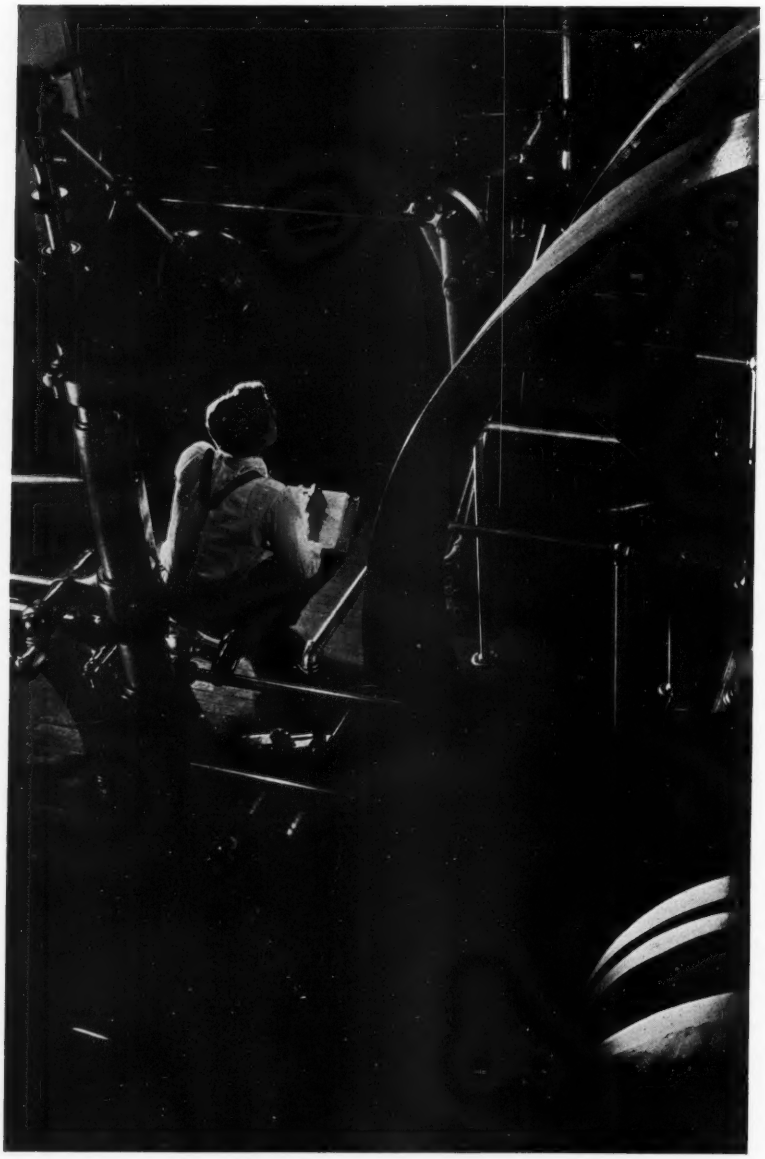

Triple Expansion Corliss Steam Engine — Mechanical Laboratory

The CORNELL ENGINEER

Volume II December, 1936 No. 3

How are Traffic Lights Regulated ?

By Dr. Herbert Ashton, C. E., '13

502 Cedar Lane
Swarthmore Penn

Rotate

The volume of traffic which passes along a street or highway is related to the speed of movement much as the volume of liquid which passes through a conduit is affected by the rate of flow. If the dimensions of the conduit are fixed, then any variations in the rate of flow are directly reflected in the volume of fluid passing. If it is desired to increase the volume of fluid passing through a conduit of fixed dimensions, the only means available is that of increasing the rate of flow; and, the greater the rate of flow, the greater will be the effect on the volume of any obstruction to the free flow. If consideration is given to the movement of traffic in this connection, the conduit, which is the city street or highway, is obviously of fixed dimensions, and the importance of the relations between the volume of traffic which has to be handled and the speed of movement is evident with the steady increase in the volume of motor traffic which is a present-day characteristic. The problem of traffic control is one of the most pressing of our transportation problems today. What effect has the speed of movement on the density and volume of traffic, and, therefore, on the problem of traffic control?

The purpose of the present article is to develop the relation between the rate of flow and the volume of traffic passing along a given artery. In carrying out this analysis, however, the analogy drawn above between the flow of a fluid and the movement of traffic cannot be carried too far. The methods familiar to engineers in the solution of problems dealing with the flow of fluids may not be used in attacking traffic problems without modification. This follows from the fact that, whereas the density of a fluid is constant, for all practical purposes, regardless of the size of the conduit or the rate of flow, the density of traffic is variable, and is a function of the momentum of the moving vehicles and the braking power available.

It is necessary to differentiate carefully between density and volume because of their close relationship and the tendency to confuse them. The volume of traffic is measured by the number of vehicular units passing a given point per unit of time. The density of traffic, on the other hand, is measured by the proximity of the separate vehicles. Volume is thus directly dependent upon the rate of flow, or speed. The volume of traffic passing varies directly with the speed, for any given density,

whereas density, as ordinarily conceived, is independent of the speed. Traffic may reach a given density, for example, at any one of a number of different speeds. This relationship has an important bearing on the safety of operation. Possible collision of the molecules of a moving fluid is of no interest to the engineer; but collision of vehicles on a busy highway is of considerable importance. The question of safety, which does not exist in the one case, is a determining factor in the other. It places limitations on the density of traffic which is the subject of investigation for any given set of operating conditions.

The relation between the speed of vehicles and the density of traffic on city streets has already been the subject of some study. Research has shown that the *rate* of movement of vehicles has an important bearing on the effectiveness of city traffic control, and charts have been constructed which give the relation between the speed of the vehicle, the length of the city block, and the cycle time, or green and red interval. Thus, the most efficient speed is affected by the length of block.

If the length of a city block is taken as 700 feet, with traffic moving at a speed of 25 miles per hour a car would cover a block in approximately 20 seconds. Supposing a car to start from any point on the main street; in order to allow traffic to cross this street for an interval of one minute without impeding the progress of the car on the main thoroughfare the adverse signal could not appear closer than the third intersection ahead of the car. The longer the interval allowed for cross traffic, obviously, the further in advance of the car must the adverse signal appear; so, too, as the speed of the car is increased. Thus, if the car were moving at 35 miles per hour, instead of 25 miles per hour, it would pass through a block in approximately thirteen and two-thirds seconds; so that in one minute the car would cover between four and five blocks. If cross traffic were still allowed one minute, the adverse signal would have to be set five blocks in advance of the car instead of three, as for a speed of 25 miles per hour. A large volume of traffic can be easily handled in this manner on a one way street by adjusting the position of adverse signals for the rate of movement desired. Actually, however, since the position of signals is usually fixed by the length of the city block, the increasing volume of traffic has been taken care of by increasing the speed of movement and shortening the cycle time at crossings, so that today the cycle time is more generally around 40

"Recognition of the Importance of Maintaining a Good Speed . . . Has Caused the Larger Cities to Construct Elevated Causeways"

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seconds. The reason for this shortening of the cycle time will be explained later. The relation between time and distance must be carefully worked out.

The introduction of cross traffic represents a complicating obstacle to the free flow of traffic; but does not in itself involve any essential difference between the laws governing the flow of fluids and those controlling the movement of traffic. In considering the effect of changes in the rate of flow, however, a fundamental distinction becomes necessary. As stated earlier, the density of a fluid remains essentially constant regardless of the rate of flow. But the density of traffic on a thoroughfare varies with changes in the speed. The greater the speed of movement the greater must also be the space between vehicles moving in the same direction if the danger of collision as a result of a sudden stop by the leading vehicle is to be avoided. Because of the importance of the space, or "headway", between successive vehicles as a factor affecting the density of traffic at different speeds, attempts have been made to derive an optimum speed, that is, some speed which, when proper consideration is given to the necessary safe headway between vehicles, will give the greatest possible volume of traffic. Any lower speed would give a movement of fewer vehicles per unit of time, as would also any speed greater than this "optimum" because of the increase in spacing or headway required at the higher speed. The density of traffic is diluted in greater proportion than the speed is increased. Fewer vehicles would, therefore, pass any given point per unit of time at any speed, either higher or lower than the "optimum".

The relation between speed and the density of traffic may be expressed by the statement that, as the volume of traffic increases, the speed must increase, to avoid congestion, and the time interval (the delays for cross traffic, including pedestrians) be reduced within possible limits. Thus, if F is the flow or volume of traffic on street A and F′ is the flow on street B, then the ratio of green to red R=F/F′, for street A, and R=F′/F, for street B.

The effect of variations in the speed on the movement of vehicles along a street may be considered next. If the volume of traffic on a given thoroughfare is 1800 cars per hour, or 30 cars per minute, passing any given intersection, at a speed of 25 miles per hour there is a free flow established One car is passing the given point every two seconds, which, at this speed, gives a spacing of approximately 48 feet between cars.

If the speed is reduced to ten miles per hour, for any reason, in order to continue passing the same volume of traffice the cars would have to be spaced 29 feet apart (center to center). The minimum distance between vehicles for safe operation was found by Greenshields to be expressed by the formula S=20 + 1.1V, where S is the

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distance center to center of vehicles in feet, and V is the velocity, expressed in miles per hour, would, therefore, according to this formula, constitute crowding beyond the point of safe operation. If the volume of traffic were twice the above figure or 3600 cars per hour, as it is on some of the larger city streets, operation at the lower speed would be impossible without spreading over into several traffic lanes. At 3600 cars per hour there would be a car passing every second, and a delay of 40 seconds, such as might be caused by traffic crossing at an intersection, would result in an accumulation of 40 cars at this point. In addition there would be a retardation of the movement of other cars represented by the time required for the cars which had been actually stopped by the cross traffic to acquire free movement again. If there were four traffic lanes there would be ten cars stopped in each lane, so that the time required to accelerate these vehicles to a normal speed again would be an appreciable interval. The check to the free flow of traffic would thus be felt by an indefinite but large number of vehicles, and for a considerable distance along the thoroughfare. The increasing importance of *maintaining* a reasonably high speed as the density of traffic increases is thus clear.

The *time* interval between cars has been shortened materially in the past few years as a result of the general acceptance of improved braking equipment. This means that the safe spacing, or headway, between cars has also been reduced, for the same spacing can now be maintained at higher velocities. It should be borne in mind, however, that, the greater the speed which is involved, the greater probably would be the *practical* difficulty of effecting any measurable increase in density. On the other hand, the points of maximum density today are not out on the open highways, where the higher speeds obtain, but within the metopolitan areas where the presence of numerous intersections prohibit the maintenance of high speeds. It is this reason, and recognition of the importance of *maintaining* a good speed unobstructed where traffic density is high, that has caused the larger cities, such as New York to construct through traffic arteries, as represented by the new elevated causeways.

It is evident from the foregoing analysis that any means by which the density of traffic can be increased will have an important effect in increasing the allowable volume of traffic for any given speed; it also will permit higher speed, which directly increases the volume of traffic passing along any given artery of transport; for it is the safe spacing of vehicles, or necessary "headway", which is the limiting factor. The theoretical minimum spacing between two cars is zero.

As the speed of transport increases, the volume of traffic on a given line increases; but the density of traffic decreases. This combination of effects has led investigators to search for an optimum, or most efficient, speed. The failure to discover such an optimum results from the fact that the density of traffic does not vary inversely, precisely, as the speed, but in a less proportion, thus providing a net increase in the volume of traffic as the speed is increased, though at a diminishing rate of increase. Using Greenshield's formula for spacing, cited above, and considering one traffic lane only, at a speed of 25 miles per hour the volume of traffic passing a given point would be 45 cars per minute. The safe spacing of cars at this speed is 47.5 feet, center to center. Now, if the speed is increased to 35 miles per hour, the headway between cars would become 58.5 feet, center to center. This is a decrease in density of 23.2%. But the increase in speed amounts to 40%, so that the net effect is an increase in volume of traffic to 52 cars per minute, or 17.7% over the volume passing at the lower speed. At a speed of 45 miles per hour the headway between cars would be 69.5 feet, center to center, representing a decrease in density of 18.8%. But the increase in speed was 28.5%, giving a new volume of traffic represented by the passage of 57 cars per minute, or an increase of 10%, approximately. Thus the volume of traffic has continued to increase, but the rate of increase has diminished.

The avoidance of costly congestions will depend upon the ability to maintain consistently a speed of movement which can be accurately determined upon the basis of the volume of traffic which is to be carried in any given case. The underlying relationships apply to either urban or inter-urban traffic, and to either motor or rail transport on arteries carrying heavy traffic.

Tapping and Trapping For Drinking Water

By Norman E. Schlenker, C. E., '37

EDITOR'S NOTE: During the past summer, the author worked in Virginia as surveyor for the Surface Waters Division, United States Geological Survey.

Among the Blue Ridge Mountains of Virginia is located the Shenandoah National Park, extending a distance of eighty miles in a North-South direction and about six to the East and West. East of the park lie the wooded foothills of the range and beyond, the Piedmont Plain, stretching toward the Atlantic. To the West is the Shenandoah Valley and in the distance, the Appalachian Chain. Lengthwise of the park runs the famous Skyline Drive. This masterpiece of road construction follows the summit of the ridge from one end of the park to the other.

After the opening of the drive, the traffic through the park increased by leaps and bounds. Surveys showed that an average of five thousand cars a day pass through the park, and at times the maximum reaches a value of twice this figure. Here one can easily appreciate the problem of supplying an adequate water supply from resources that are limited in quantity. Water was required

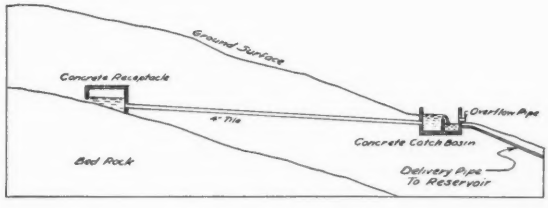


Fig. 1. Strata Diagram

at picnic and camping grounds, at three restaurants and three gasoline stations, aside from the demand of the five CCC camps located along the drive.

Before telling of the solution to this problem, it might be well to describe the geological conditions that determined the type of supply necessary to provide a maximum of servicability and dependability at a minimum expense. The rock constituting the range is an argillaceous limestone, somewhat faulted and cracked by the upheaval of formation. Directly over the bed rock is found a disintegrated and somewhat degenerated granite gravel moraine left by glacial action. The depth of this deposit varies from nothing to a maximum of ten or twelve feet. Above the gravel deposit is a clayey subsoil formed by the decomposition of the granite moraine. There is no definite line of demarkation between the soil and gravel since the change depends on the extent of decomposition. In places where the original deposit was thin, only the clayey subsoil remains. In numerous spots, there are found outcrops of bed rock where none of this gravel exists.

Whatever of this gravel is left acts as a storage material for water. The melting snow and heavy spring rains saturate the soil and allow water to percolate to the underlying storage material. Between May and November little or none of the precipitation can reach the storage material, for its quantity is insufficient to penetrate the impervious subsoil. During this period, ground water is consumed by run-off, vegetation, and evaporation.

At points where the topographic conditions are right, the water bearing stratum contacts the ground surface to form a spring. The spring will flow with an abundance of water when the stratum is saturated because of the hydraulic head built up between the bed rock and subsoil. Later in the season, when the water supply is partially depleted, the rate of flow decreases markedly, because of the decrease of head, until a minimum flow is reached in October. At points below the spring, the water flows on the surface, forming the headwaters of mountain streams.

In most cases it has not been feasible to obtain water from the streams themselves in that they are invariably at elevations so much less than that of the points of demand, that pumping expenses would entail a prohibitive expense. Therefore common sense dictated that the water be obtained at points above the elevation of consumption and conducted to them by gravity pipe lines.

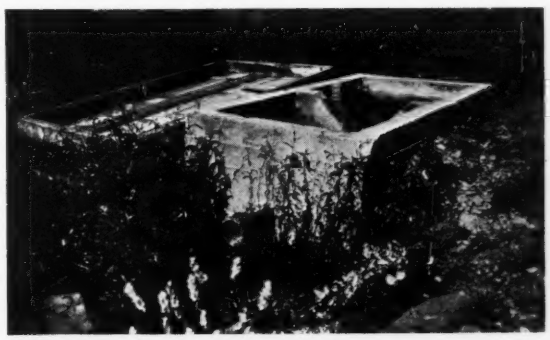


Fig. 2. The Finished Spring

In order to accomplish this it was necessary to develop artificial springs at points where no natural springs existed, but where an ample volume of storage material was thought to be. For instance, if it was assumed that the average depth of water bearing material was three feet and the porosity of the material was 35%, an area of five acres would be necessary to sustain an average flow of five gallons per minute. This assumes that the stratum is in a saturated condition in April, after which the input diminishes rapidly to zero until November. Actually, the flow from a saturated stratum will be several times the flow two or three months later. Unfortunately the greatest demand is in the month of September, when the flow is almost a minimum. Hence it is necessary that the spring drain a sufficient area so as to provide a flow large enough to supply the maximum demand with the minimum flow. Because of the numerous variables that affect the flow, such as slope of the stratum, uniformity, and depth of the gravel, all of which are difficult to determine, no formulae permitting a rational design have been developed.

The type of construction now being used is composed of two units; a receptacle for the interception of the water and a catch basin used for the removal of grit in the water and the measurement of flow.

The first step in the process of construction is the excavation for the receptacle accompanied by the excavation of a ditch later used for the location of the tile pipe between receptacle and catch basin. The immediate use of the ditch is to keep the excavation free of any water. After the work is carried to bed rock, forms are built for the four vertical walls of the structure. The concrete is then poured in the clay. Provision is made for a cover to be added later. Important features are the clearance at the upper end to allow for the inflow and a cut off wall extending laterally from the structure to more efficiently guide the water to the receptacle.

The location for the catch basin is made far enough down-hill to allow a sufficient slope for the tile pipe and having its elevation close to the surface. The outside dimensions are of the order of six feet long, three feet wide and three feet deep. The details are shown in Figure 2.

It can be seen that the structure is divided by a concrete wall fitted with a steel ninety degree triangular weir notch over which the water flows into the other compartment, where it is led away by a steel pipe. Attention is called to the gage in the upper compartment. Readings of the water surface indicate the height of the water above the vertex of the weir plate. Thus the quantity of flow can be computed. The tile pipe at the lower end of the catch basin is an overflow pipe to care for the discharge of any water that is in excess of the amount that can be carried by the delivery pipe.

At present there are some sixty odd springs developed in the park; each supplying water at the rate of from one to fifty gallons a minute during the period of minimum flow. In an attempt to correlate hydrological data with spring flow data, the gage of each spring is read daily and rain gages are placed at six strategic locations. As yet, there is insufficient data collected from which to draw any important conclusions, but it is hoped that within a few years, some relations between rainfall and spring flow can be determined.

HISTORIC SALVAGE

At 2:30 o'clock of August 9 last, the cold waters of Lake Champlain gave up what was perhaps the most complete and best preserved specimen of fighting craft used in our War of Independence. This specimen was the gondola *Philadelphia* which was sunk on October 11, 1776 by the British under the command of Gen. Sir Guy Carleton. The boat, which was an important element of Brig. Gen. Benedict Arnold's fleet, has been described for us by historians who offered statistics on the number of men carried and the caliber and number of the guns that formed its battery.

Now we have visible evidence of its makeup and its structural features, remarkable for its preservation, and impressive as an indication of what our forefathers were able to do under the most adverse conditions with the crudest of supplies and implements.

The British were able to draw upon the splendid shipyards they possessed, the splendid seamen they had trained, and the efficient system long existant and characteristic of their naval forces.

Opposed to this, the American squadron, with the exception of three ships was the product of a hastily con-

structed shipyard at Skenesborough, Vt., at the southern end of Lake Champlain, where the neighboring forests could be counted upon to furnish the necessary timber. The nucleus of skilled labor was supplied by a handful of shipwrights who were marched from the Atlantic seaboard. The farmers and militiamen of the nearby region were recruited to complete the construction forces.

Speed of operation was the most important factor. The design, however, complicated matters. For operation on the waters of Lake Champlain, it was necessary to design a craft that could be maneuvered either under canvas or with long oars, when a favorable wind was not blowing. Also, to add to their mobility both in attack and retreat, the vessels had to be of light draft. The gondola *Philadelphia* is a living monument to the genius of those pioneer American shipping engineers.

While in action, the *Philadelphia* was hulled several times at the water line, and she sank in the deep waters of Valcour Bay. The exact position of the gondola was not known until last August when Capt. L. F. Hagglund, expert at refloating wrecks, with the collaboration of J. Ruppert Schalk, engaged in sweeping operations and came across the wreck. Divers descended and ascertained its identity by checking up the dimensions found and the assumed dimensions of the *Philadelphia.* A final check was made by Capt. Hagglund himself, who donned a diving suit and descended to make a thorough examination of the wreck—inside and out.

The job of floating the gondola was complicated by the very nature of the material being handled. The immediate problem was to lighten her by clearing away her armament which consisted of three sizable guns, and removing all other dead weight. The cannons were reclaimed with the aid of empty tar drums serving as submergible pontoons. These were filled with compressed air to provide the necessary buoyancy to lift the old muzzle-loaders, one by one. When sufficiently stripped, the wreck was brought to the surface by a floating derrick that could exert a pull of 15 tons. But before it could be lifted it was necessary to take precautions against damaging the aged and water-logged gondola when freeing her from the grip of the lake bottom. That is to say, the lifting pull had to be distributed so as not to overtax at a single point the keel or backbone of the craft. These preparations were made by an experienced diver, William Lilja.

First the diver, by means of a jet of high-pressure water, tunneled under the keel of the *Philadelphia* at three places at intervals of about 20 feet, and through those openings he passed hempen ropes to form enveloping slings which were carried up and secured to three spars laid across the vessel and held down against her rail at each side. The spars functioned as spreaders to keep the slings from drawing inward against the hull planking when a lifting pull was applied. The slings were extended upward by six cables and brought together at a single shackle that was linked by a length of chain to the hoisting tackle of the derrick. With the slings taughtened by a slight pull only, the diver used the water jet to wash away the contact between the bottom of the wreck and the mud of the water bed; and when the hulk was thus freed, the hoisting engine was turned over slowly to minimize any stresses on the rising craft.

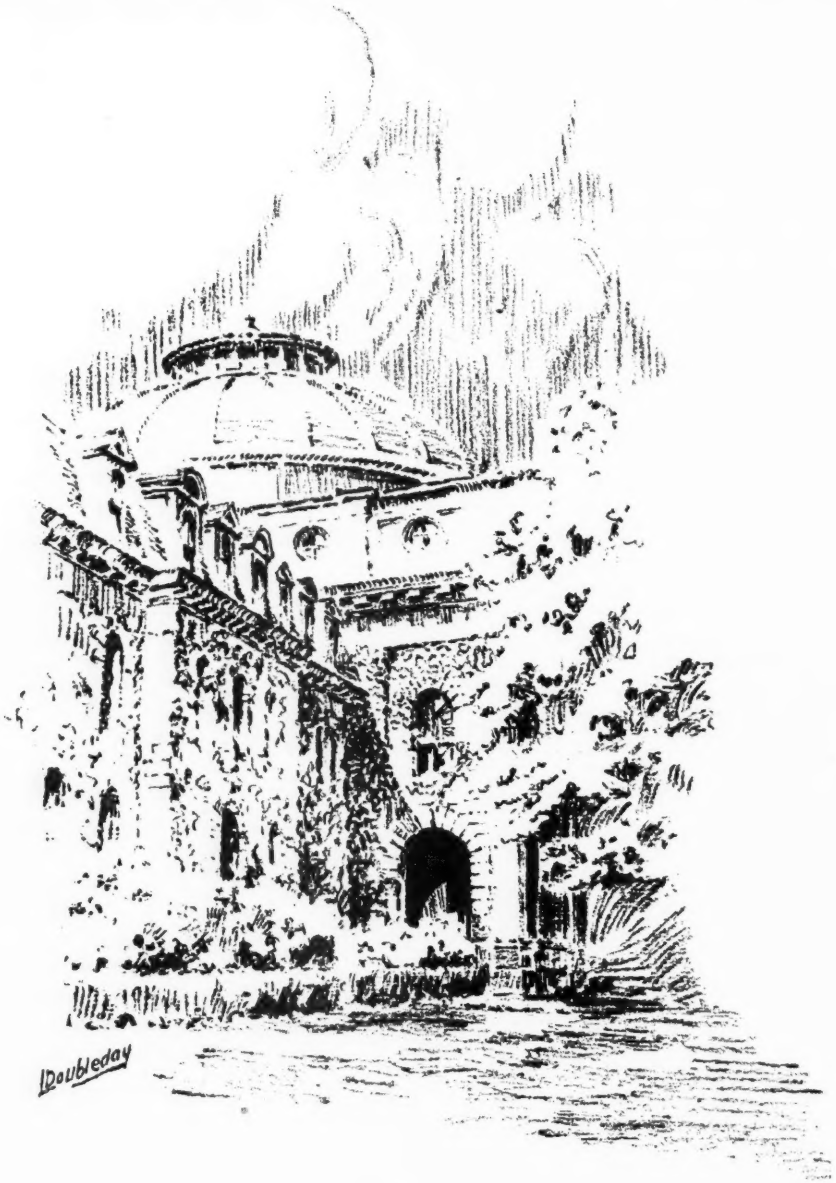
Suspended from the floating derrick, the *Philadelphia* was transferred slowly to shallow water near Valcour Island. The gondola was then lowered gently to the water bed, examined, patched, pumped out and made ready for towing to Burlington, Vt.

The state of the wooden structure of the boat is really remarkable, especially when compared to the state of her iron fittings which were quite corroded. This is all the more surprising in the light of the necessity for speed and the great probability that the timber used was cut shortly before the craft was built and no seasoning was possible. Another peculiar feature is that of size. The gondola has a water-line length of 54 feet, a maximum beam of 15 feet, and a depth of but 5 feet between her rail and her keel. Forward there is a shallow platform or deck on which her bow gun was mounted; a smaller deck at the stern served for navigational purposes; and amidships, abaft the single mast, a lower deck afforded a platform for the working of her two broadside guns. The bow gun was a 12-pounder, and the broadside guns were 8-pounders—all, of cast iron. The former, when being maneuvered for loading and lifting, slid between wooden rails secured to the deck, while the 8-pounders were mounted on trucks that have disappeared, although their carriages still retain their axles. Great wonder then, how such a craft was capable of quartering a complement of 45 men.

Many curiosities were found aboard—mostly metal relics of a military sort. Uniform buttons, shoe buckles and other adornments as well as pewter spoons and mess-kits were found in rather well preserved forms.

The broad wind swept waters of Lake Champlain can be very uncomfortable in the fall of the year, and, remembering that the men who manned the *Philadelphia* and her sister ships were not sailors nor were they used to conditions afloat, it was fitting tribute to these patriots of 1776 that upon the emergence of the old craft a replica of the Colonial flag carried at the time of the Battle of Lake Champlain was nailed to the mast. When the vessels rail was awash, there was a brief pause for silent prayer and a firing of three volleys in honor of the men who had fought and died on the ship upon that fateful October 11, 1776.

EDITOR'S NOTE—Material for this article was taken from the July, 1936 *Compressed Air* magazine.


Doubleday

Merry Christmas

and

Happy New Year

ENGINEERING AND FARMING INTERLOCK

It wasn't long ago that this country was aflame with discussion of Technocracy and the demand for a "researcher's holiday." Most people feared that new labor saving devices and developments were responsible for the beginning of a permanent depression. How queer it is that we are now beginning to believe that the road to recovery lies in the opening of new fields through technical development.

Organized research is a 20th century development and only recently has it been squarely faced with problems of entirely new material processing. In the practical applications of physics through machine design, the definite limitation set is that of the properties of the materials available. Considering where civilization and technical development are now, it seems desirable to develop new materials to give room for further expansion, materials that will be easily adaptable to specific demands, cheaper than natural resources such as the base metals, and by all means unlimited in supply.

This last requirement seems to point to the use for raw materials, of something that grows, something the farmer can produce. This hook-up is not entirely new though, for there has always been somewhat of an interdependence between agriculture and industry. The farm for many years has been dependent on industry for tools and luxuries, while industry in turn has relied on the farmer to supply food and some materials. Once, long before the day of commercial chemistry, we were dependent on agriculture for all we had of textiles, colors, and foods. Then came a swing to the far extreme and now possibly a return. Henry Ford has said that "Someday we may grow an automobile, or at least the greater part of an automobile." This is not impossible.

Some day (and this is happening already) substitutes for metals, grown from the ground, with greater strength and lightness may commonly replace present fabricating materials.

Such discussion as has preceeded may suggest an answer to the problem of handling the farmer's surplus. Through more research, of the type to be mentioned later, it appears possible not only to use up the farmer's surplus, but in addition to create a demand for more. As a most desirable by-product, additional industrial jobs will be formed, alleviating the unemployment situation.

Principal among the developments on processing farm products is that of the soy bean. This vegetable, well known in powdered form as a table sauce is now pressed, separating oil and fiber. The oil is then used as a base for the plastic knobs on a popular low priced automobile. The fiber is returned to the farmer as a feed for his cattle.

Other processes border on a field that may in the near future mean more to us than we realize now. This is the treatment of farm produce for alcohol. The American Petroleum Institute estimates that a maximum of only a 25 year's supply of crude oil for power consumption is now available. For many years alcohol has been recognized as a possible substitute for gasoline for use in internal combustion engines. Recent developments have shown that this guess will probably prove to be the solution to the fuel problem.

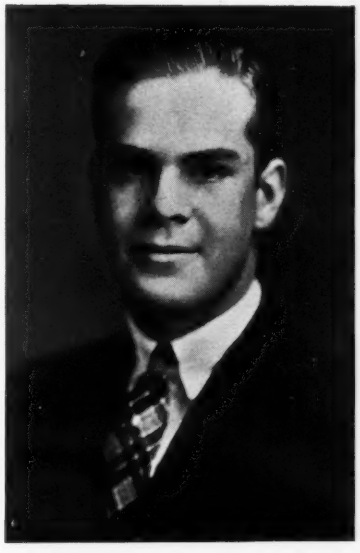
A refinery has been built for the reduction of farm produce to power alcohol and it begins to appear that it might be much wiser to use some of this now wasted crop produce to augment the present supply of gasoline. In fact, in some cases, farmers themselves are making power alcohol for use in their own farm tractors.

Another phase of this "industrial" type of research has shown the farmer that certain imported crops can be grown right here at home. Moreover, it tells him how to do it and helps to turn useless soil into prosperous farming territory.

One year and two annual conventions old is the Farm Chemurgic Society. It is an organization of industrial researchers and farmers interested in the above sort of development work. Yet this Chemurgic movement isn't new, it is simply a continuation of the processes that time and again have carried America forward in times of depression and set-back.

Industrial supplies, materials which have to be produced hauled, transferred, stored, refined, manufactured, stored again, distributed, sold and used can come only from four sources. These are the mines, forests, sea, and the soil. As time progresses, the engineer finds that first forests, then mines cannot supply him with the type or quantity of materials he needs. Does the solution lie in the soil?

Do You Know These Men?



RICHARD WARREN KUNKLE

President of Eta Kappa Nu, a member of Tau Beta Pi, Phi Kappa Phi, The Delta Club, and the Intramural Athletic Board tells but a small part of the interesting career of Richard Warren Kunkle, E.E. of the class of 1937.

While at Cornell Dick has tried to find a happy medium between studies and extra-curricular activities. He places a very high value on the personal contacts gained through participation in athletics, membership in social societies, and work on committees. To accomplish this he has played on the Freshman Baseball and the Intramural Baseball and Basketball squads, served on the Freshman Advisory and Engineer's Ball Committees, and worked with the Student Agencies, in addition to membership in the honor societies mentioned above.

Summers Dick has spent doing practical work in his chosen field. His first job was as an electrician's helper, doing house wiring and repair work. After running afoul of the local Electrician's Union he was given a permit which permitted him to work under Union contracts. Later he was employed by a power company with which he hopes to eventually become connected after completing his studies. This will not be immediately after graduation, however, as he hopes to first enter a student training course with one of the large electrical concerns.

Whenever he is able to find a little spare time Dick enjoys reading books of a light and humorous vein. He is particularly fond of the humorus situations which characterize the work of P. G. Wodehouse, and the clown-like antics of humorist Robert Benchley.

With such a well rounded educational background Dick should find a position of importance in the electrical engineering field. In case he is unable to, Dick will confide with a smile that his trump card lies in the fact that he is rated a first-class butcher by those in the meat business for whom he has worked in past summers.

FREDERICK FORD SAMPSON, JR.

"An undergraduate should work as hard toward a social education as he does toward his technical education." Such is the philosophy by which Fred Ford Sampson Jr., has been guided in his college career at Cornell.

Born in New York City, Fred prepared at Davis High School in Mount Vernon, New York, where he was a member of both the swimming and the tennis team, and manager of cross country. Academic honors were awarded him by election to the French Club and the National Honor Society. Entering Cornell as an A.E. in 1933, Fred was soon recognized as not only an outstanding student, but an all around man. He was awarded the Sibley Prize in his Junior year, elected to Kappa Tau Chi, and served on the Freshman Advisory Committee. He subsequently joined the American Society of Mechanical Engineers, served on the Athletic Association Membership Committee, and the Dartmouth Hop Committee. Now President of his own fraternity, Delta Kappa Epsilon, a Senior representative on the Student Council, a member of Sphinx Head and Kappa Beta Phi, Fred has received his highest honor by election to the Presidency of Tau Beta Pi, national honorary engineering society.

Summers he stays at the family home in Canada where he spends his time swimming, hunting, fishing, and motorboating. Regarding his prowess as a sportsman Fred is quite modest, but his mechanical inclinations make themselves known by a desire to tinker with motors. His greatest pleasure comes through rebuilding outboard motors which he likes to revive from junk heaps and put in first class condition for his friends. How he has managed to keep his own antiquated Johnson Sea Horse motor running like new remains a complete mystery to his friends, and speaks well for his own mechanical ability.

COLLEGE

E. E. SMOKER

A smoker and get-together of Junior and Senior E.E. students was held on the evening of Wednesday, November 18 at the Theta Xi house. Dean Diederichs presented a short talk on the present engineering curriculum and the difficulties involved in preparing such a curriculum. He was followed by Professor Lincoln who welcomed the Juniors into the ranks of the E.E.'s.

Films of the Yale and Penn State football games were then shown amid comments loud and varied from the audience. Following this, cider and doughnuts were served and friendly rag-chewing between the members of the classes and the faculty took place until the gathering broke up.

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ATMOS

The Atmos Club, in a meeting on December 8, elected the following men of the Mechanical Engineering School: Class of '37—T. B. Kelly, R. G. Luberg, J. B. Perkins, H. A. Raisler, G. S. White; Class of '38—J. C. Antrim, G. C. Brainard, F. M. Brister, D. H. Brown, F. F. Cepperley, F. E. Hibbard, W. S. Homewood, R. W. Marchant, P. B. Scott, F. Svenningson.

Atmos is an honorary society, the purpose of which is to promote extra-curricular relations between students and the faculty.

—o—

A. S. C. E.

A meeting of the American Society of Civil Engineers in 2 West Sibley on December second was called to encourage the members to continue their drive for memberships, trying to make the college 100%, and to hear a discussion of earth dams by Mr. Benjamin Hough.

Mr. Hough, who is a member of the U. S. Army Engineers in this district, gave an illustrated lecture on the 'Quoddy project.' He showed the relation of soil physics to actual construction and for his example he took the Quoddy dam project in Maine. He described several new devices developed to facilitate the illustration of soil action. He also told of the construction of two earthen dams.

—o—

ARCHITECTURE

Krider and Irish Win Elections

At a recent election in White Hall, Robert A. Krider, '37, was elected President of the Architectural School, and Charles B. Irish, '37, was made Treasurer. These men will represent the undergraduates in their dealings with the faculty; they will also function on the Honor Committee.

New Equipment for Central Drafting Room

The drawing board slide with a tub at the bottom and the famous Beaux Arts Ball, held in the hurriedly transformed drafting rooms in White Hall, seem doomed. To the architectural alumni this will seem a shame, but this is not a faculty repression; it is merely the result of the rearrangement of the facilities in the august abode of architecture.

Upon returning this fall the students found the center of the three drafting rooms repainted, all in one color. and the old belly-bumping drafting boards rearranged. Along the east and west walls, drafting tables designed to accommodate four men each are placed in booths. These provide better storage and more wall mounting space. Down the center of the room tables similar to the old ones still stand, though they are considerably rehabilitated. Plans for the future call for similar treatment of the other drafting rooms.

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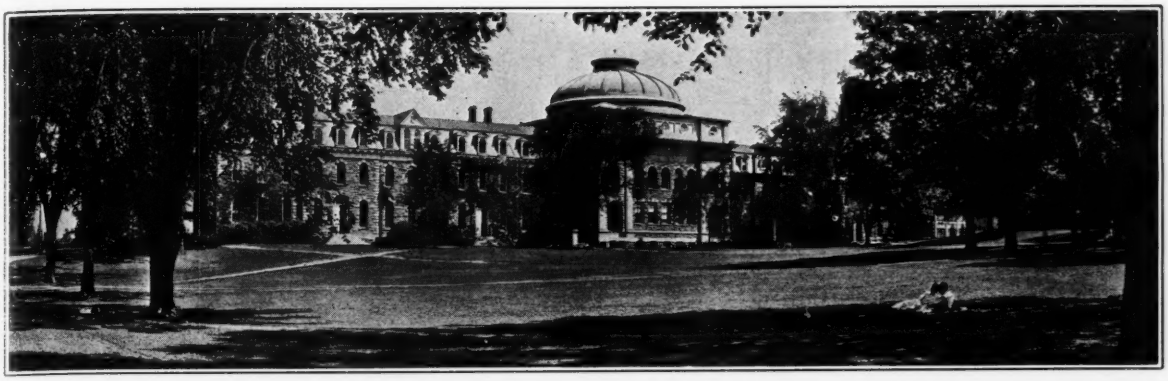
ERRATA

The Cornell Engineer wishes to correct an error appearing in the November issue, namely H. N. Ogden is Professor of Sanitation, not Structural Engineering as indicated in the School Notes.



NOTES

THE REGISTRATION OF ENGINEERS

Dr. D. B. Steinman, Consulting Engineer, New York, was guest speaker at a joint meeting sponsored by the Ithaca sections of the A.I.E.E., A.S.C.E., and A.S.M.E. in Baker Laboratory recently. After an introduction by Professor Hollister, Dr. Steinman spoke on the "Registration of Engineers."

The registration of professional engineers in New York State started in 1920. Since then it has been deemed advisable to change the requirements and entrance examinations to raise the standard of the professional engineer.

Dr. Steinman states: "The primary reason for the new registration laws, and the one which gives them constitutional legality, is for the protection of the public safety. Society has seen fit to protect the safety of the public by regulating certain professions, and the work of the engineer if unregulated might lead to more danger than any other professional work.

"A second reason, from the engineer's viewpoint, for requiring registration is to protect the good name of the profession. We do not want the public to think of the engineer as a cross between an electrician and an automobile mechanic. But if any man—unqalified, imposter, or unscrupulous—can hang out a shingle and call himself 'engineer', then the public estimate of our profession will be dragged down into the mud. There is no other way to protect the reputation of our group, than to register the qualified engineer, and bar the unqualified. Court action is not always necessary to stop the illegal use of the title. Often the attention of the offending individual need only be drawn to the misrepresentation, and he voluntarily corrects it.

"Protecting the rights of the practice of engineering is another advantage of registration, for in the registration laws we define the sort of work which the Professional Engineer is qualified to do. For example, years ago, in this state, the architects tried to monopolize the field of structural design, and actually secured legislation to that effect.

"A profession," said Dr. Steinman, "cannot expect to receive recognition until it is recognizable. Registration places the force and sanction of the law behind the aspirations of the profession to be recognized."

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C. E. SMOKER

About 100 of the students and faculty of the Civil Engineering School met in Willard Saright Hall on December 9 for a smoker, sponsored by Rod and Bob. L. A. Christensen '37, was toastmaster.

Captain M. H. Davis of the Army Ordnance Department, the principal speaker, gave a talk on "Strategic Materials." He explained how a list prepared in 1920 of 26 necessary materials which might be cut off from us in case of war, had been cut down to one material, manganese. He explained in detail how this had been done.

Other speakers included Dean Diederichs, Director Holister, and Former Dean Kimball who reminisced on passed experiences. The meeting closed with long "bull sessions", and the serving of refreshments.

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MARTI SPEAKS BEFORE ELECTRICALS

On Friday, December 4th, Mr. O. K. Marti of the Allis-Chalmers Company gave two talks before the Electrical Engineers on the use of electronic devices in the development of direct current transmission. His talk at noon concerned the Future of Direct Current Transmission with a short summary of what has been accomplished in that field. In the evening he discussed the characteristics and applications of high-current mercury vapor valves for conversion and inversion of alternating current. A demonstration of a mercury vapor rectifier was given thereafter in the electrical laboratory by Prof. Ballard and Asst. Prof. B. K. Northrop.

CORNELL SOCIETY *of* ENGINEERS

J. D. TULLER '09, PRESIDENT

WALKER L. CISLER '22, VICE PRESIDENT — ADAM C. DAVIES, JR. '15, VICE PRESIDENT

DAVID HARMON '31 RECORDING SECRETARY — JOHN P. SYME '26, SECRETARY AND TREASURER

"The objects of this Society are to promote the Welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Column

Fellow Engineers:

As this is being written the annual convention of the American Society of Mechanical Engineers is being held in New York. Among the Cornellians from out of town who were observed at the convention or who stopped in at the Cornell Club for physical or mental refreshment were: James Parker, W. A. Carter, Frank Nitzberg, Frank Rhome, Paul Thompson, Fred Conklin, J. W. Schwartz, L. B. Swift, Walter Todd, Former Dean Kimball and various members of the faculty.

Unfortunately the Farrand dinner which is being held the evening of December 3rd comes on the same evening as the A.S.M.E. dinner. Some of our members with a fine sense of loyalty are attending both functions in the same evening, although they will obviously not be able to do justice to either.

Also as this is being written, State Senator John J. McNaboe's charges that Cornell University is the "center of revolutionary communistic propaganda" are being spread upon the front pages of the newspapers. Cornell seems to be coming out of the affair in a very creditable fashion; the under-graduates having a share in the proceedings by sending a group telegram to the Senator while the Sun's editorial comment was that "as far as we can see the reddest thing about the Senator's investigation should be his face." It is understood that Dr. Farrand will have something to say on the subject when he addresses the alumni at the dinner at the Waldorf-Astoria.

In line with the increasing demand that the Engineer be more socially minded, could not Engineers in industry very well perform a task which this writer believes is urgently needed at this time? This consists in spreading elementary economic education before the rank and file of people in this country. It would include a portrayal of how business and industry function under private initiative and of the large benefits that would be lost through public ownership and operation of business and industry. This sort of education should be dramatized as much as is consistent with the subject in order to give it popular appeal; and the evils which we have suffered from should not be minimized nor should the desirability of correcting the defects in the system be ignored.

From all quarters we hear reports of increased interest and enthusiasm in university activities. This was particularly noticeable in the reports of the faculty members who attended our October dinner in New York and has been confirmed by recent reports in the Cornell Alumni News. The straightening out of the athletic situation has perhaps had something to do with the revival of the old Cornell spirit but it is much deeper seated than that, extending as it does into even the graduate and research work that is being done.

Mr. Conant Van Blarcom, '08, one of our Engineering alumni who has filled the position of Superintendent of Buildings and Grounds at the University in a very creditable manner during the last several years has resigned and been succeeded by another Cornell Engineer, Mr. Hugh E. Weatherlow, '06, who had been connected with the Raymond Concrete Pile Company for many years.

In conclusion the writer wishes to invite the Engineering alumni to make use of this column in putting their ideas and views before our members for discussion. Anything in line with the objects of the Society, which is "to promote the welfare of the College of Engineering, its graduates and former students, and to establish a closer relationship between the college and the alumni" will be welcomed. Communications should be addressed to the writer, % The Cornell Society of Engineers, 245 Madison Ave., New York City, N. Y.

Sincerely yours,

J. D. TULLER,
President

His job is to look for trouble before it happens. He is one of many who inspect telephone apparatus regulary, even when nothing is wrong. His work is called "preventive maintenance." ¶ This work is of the highest importance. It helps to prevent interruptions to the service; often forestalls costly repairs, or replacements; helps keep telephone service at highest efficiency. ¶ To plan this work requires management with imaginative foresight and the ability to balance the many factors involved in the maintenance problem.

BELL TELEPHONE SYSTEM

Tonight—call up someone in the old home town—after seven, when rates to most points are lowest.

ALUMNI NOTES

IN MEMORIAM

We take this opportunity to pay tribute to the memory of a young and promising alumnus, Philip Lanahan Welker. Mr. Welker met with a most untimely death on December 16, 1935, just as he was beginning a distinguished career.

Much of the following information is obtained from a memoir written by William Bowie, Chief of the Division of Geodesy in the United States Coast and Geodetic Survey, and published recently by the American Society of Civil Engineers.

He was born in 1905, in Baltimore, Md., and after going through his preparatory education Mr. Welker entered Cornell in 1924 to study Civil Engineering. He majored in Geodesy while at the University.

At graduation in 1928 he applied for an appointment to the field force of the Coast and Geodetic Survey. He did not secure it, however, because of an imperfection in his eyesight, necessitating the use of glasses. He did receive, however, a position as engineer in the office of the District Engineer in the Engineer Corps, U. S. Army, at New Orleans. Most of his work in this capacity was in the field, as Inspector on the Willow Grove, the Lucy Goldmine, and the Convent Levees, and as Inspector, Instrumentman, and Chief of Party on the Bonnet Carret Spillway at Sellers, La.

Welker resigned his government position in 1930, to become associated with Sanford and Brooks Company, Engineers and Contractors of Baltimore, Norfolk, and Charleston. As a field engineer, he worked on the Pennington Avenue Bridge in Baltimore, Canton Railroad Pier No. 11, for the Baltimore Mail Steamship Company, and Nanticoke River Bridge at Vienna, Md., the plant of the Arundel-Brooks Concrete Corporation, and the construction of the Bohemia River Bridge. Besides this work he worked on designs and estimates in the office.

After Mr. Welker resigned that position, early in 1933, he became a Junior Civil Engineer on P. W. A. project at the District of Columbia Penitentiary, at Lorton, Va.

In March, 1934, he finished the project, and a few months later became a member of the Division of Geodesy of the United States Coast and Geodetic Survey his ambition in 1928. He was engaged for the most part in making computations of field observations, and was in the field as a member of a triangulation party near the District of Columbia.

Having distinguished himself in certain phases of this work—field observations, mathematical computations, and adjustments of observations—he was appointed one of two engineers to do triangulation work along the boundary of Guatemala and Honduras.

His work on the field observations was highly praised by Lieutenant Lushene, the other engineer of the project. in a report on the operations. After the Lieutenant had returned to the United States, Mr. Welker remained in Guatemala to continue with the necessary computations and adjustments.

During this period he contracted a throat infection, which apparently subsided for a short time, but later reappeared. His condition was so serious that he was rushed to the Tuoro Infirmary in New Orleans, but in spite of the finest medical attention, he passed away on December 16, 1935.

Mr. Welker was married in December, 1929, to Flora Mary, of New Orleans.

He was a member of the Society of Military Engineers and the Engineers Club of Baltimore. In 1930 he was elected a Junior of the A.S.C.E.

'82 C.E.—It is with deep regret that we record the death of an eminent alumnus, John Cassan Wait. Mr. Wait graduated from Cornell as a Civil Engineer in 1882 and received the degree of M.C.E. in 1891. Norwich University awarded him the degree of Master of Science in 1887, and in 1891 he took a degree in law at Harvard.

Mr. Wait was born in Norwich, New York, in 1860. After attending the public schools there and before entering Cornell, he worked for a short time as an apprentice in a planing mill. He received a scholarship to this university in 1878 and entered the School of Civil Engineering, beginning what was to be a long engineering career. From 1887 to 1891, while he was studying law, he was an instructor and assistant professor at Harvard.

One of Mr. Wait's notable engineering undertakings was a project for the improvement of the canal system of New York State in 1897. He was the chief engineer for this $9,000,000 job. In 1900 he was appointed Assistant Corporation Counsel in New York, in which capacity he served until 1904; during this time he was Acting Corporation Counsel on several occasions. Mr. Wait was a member of the ASCE, the Municipal Engineers of the City of New York, the American Society of Refrigerating Engineers, and the New York State Bar Association.

Besides several genealogical books on the history of his distinguished New England family, Mr. Wait contributed to technical literature with the following books: "Car Builders' Dictionary", 1895; "Engineering and Architectural Jurisprudence", 1897; "Law of Operations Preliminary to Construction in Engineering and Architecture", 1900; "Law of Contracts", 1901; and "Calendar of Invention and Discovery", 1904. He also wrote many articles for various technical publications.

Stress & Strain

A story is told of a young man who went walking in the country. He suddenly came upon a nice horse grazing in the field. He was perhaps the prettiest horse he had laid eyes on, so he walked up to the farmer nearby and said:

"Do you want to sell that horse?"

"Sure, I want to sell the horse," the farmer replied.

"Can he run?"

"Can he run? Look!" Thereupon he slapped the part of the horse sometimes used for that purpose, and off trotted the horse full speed, running just as prettily as could be.

The young man thought he had never seen a prettier horse. Suddenly the horse ran full speed into a tree.

"Is he blind?" the young fellow hurriedly blurted.

The farmer thought even quicker.

"Hell, no," he drawled. "He just doesn't give a damn."

—Gargoyle

* * *

The squad of frosh ROTC recruits had been out to the rifle range for their first try at marksmanship. They knelt at 250 yards and fired. Not a hit. They moved up to 200 yards. Not a hit. They tried at 100 yards. Not a hit.

"Tenshun!" the sergeant bawled. "Fix bayonets! Charge! It's your only chance."

* * *

The collector approached a parishoner and held out the box. "I never give to missions," whispered the parishioner.

"Then take something out of the box, sir," whispered the collector. "The money is for the heathen."

* * *

Store manager: What do you mean by arguing with that customer? Don't you know our rule? The customer is always right.

Floorwalker: I know it. But he insisted that he was wrong.

* * *

Conducter: Did you get home all right last night, sir?

Passenger: Of course—why do you ask?

Conductor: Well, when you got up and gave the lady your seat last night, you were the only two in the car.

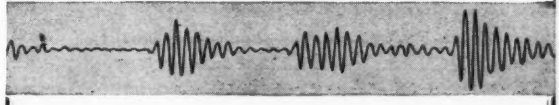
* * *

"Frequent water-drinkings," says the specialist, "prevents you from becoming stiff in the joints."

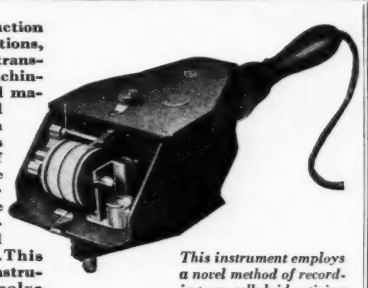
"Yes," says Jones, "but some of the joints don't serve water."

—California Engineer

CAMBRIDGE VIBROGRAPH
***measures the* JITTERS**



• **Effects of construction and blasting operations, heavy and rapid transportation, new machinery, more powerful marine propulsion and many other modern industrial demands make the study of vibration imperative for safety and comfort. The Cambridge Vibrograph accurately measures and records vibration. This robust, portable instrument has helped solve many vibration problems and disputes.**



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ALUMNI NOTES

'90 CE—We note with regret the passing of George Hicks Walbridge, famed construction engineer and authority on the cost of producing electric power by steam and water. At the age of 66, after many years of service with the J. G. White Engineering Co. and numerous other corporations, Mr. Walbridge succumbed to arteriosclerosis last August. Surviving are his widow, Mrs. Mary Gilley Taylor Walbridge, and a daughter, Mrs. Elizabeth Walbridge Bailey of Larchmont, N. Y.

'94 ME—Paul Messer, for many years resident in permanently to the United States and is living with his family at King's Crown Hotel, 420 West 116th Street, New York City.

'95 ME (EE)—Edward Heitman, Jr., chief engineer of the Kelvinator Corporation, is director of the Temperature Research Foundation, established by the Kelvinator Corporation to place before the public latest findings of modern temperature engineering. Headquarters are at 80 Broadway, New York City.

'95 ME—George T. Ladd, president of the United Engineering & Foundry Company, Pittsburgh, Pa., told stockholders recently that the company is employing more than its normal number of employees, and that operations at present are being maintained on the basis of a forty-hour week, thus requiring considerable overtime pay.

'97 ME—Frederick D. Herbert, of the Kearfott Engineering Company, has been elected a director of the National Council of American Shipbuilders for a two-year term.

'01 ME—Fred G. Perkins is a member of the exhibition committee of the Defenders of Democracy which recently showed privately in New York City ten murals depicting personalities and policies of the New Deal.

'01 CE—Ezra B. Whitman was a consulting engineer in New York City after his graduation, going on to Baltimore, Md., early in his career as division engineer in charge of design and construction of a sewage disposal plant there. He was then appointed chief engineer and president of the Baltimore Water Board. After the War, in which he served, he became a member of the firm of Norton, Bird and Whitman, now incorporated into the present firm of Whitman, Requardt and Smith, West Biddle Street at Charles, in Baltimore. From 1924 to 1927 he was chairman of the Maryland Public Service Commission, which during that time reduced Baltimore taxes when other large cities were increasing theirs. From 1933-35 Whitman was chief engineer of the West Penn Electric Company, Pittsburgh, Pa. One of his sons, Ezra B., Jr., graduated in 1932, and John G. was Class of '36; his daughter is the wife of T. Brian Parsons '29.

'02 ME; '35 BS in AE—Joseph P. Kittredge is manager of the Sharon, Pa., plant of the National Malleable and Steel Castings Company. His son, Joseph P. Jr., '35 is associated with the Republic Steel Corporation in Warren, Ohio, living at the Dana Hotel.

'03 ME—John H. Van Deventer, editor of Iron Age, told delegates attending the annual convention of the National Metal Trades Association in New York City recently that research in the coming fifteen years will help solve the farm problem, add many new metal alloys to the thousands now in use, and bring drastic changes in the tools used for working metals.

'06 ME—Howard L. Aller is chairman of the board of the American Power and Light Company.

'06, '08 ME, '10 MME—George W. Lewis has been awarded for 1936 the Daniel Guggenheim Medal for "outstanding success in the direction of aero-nautical research and for the development of original equipment and methods." Now director of research of the National Advisory Committee for Aeronautics in Washington, D. C., Dr. Lewis designed the first experimental Roots type supercharger for aircraft engines, based on the Roots blower, and made many other contributions to aeronautical development. He was instructor in Engineering at the University from 1908-10 then Professor of Engineering at Swarthmore to 1917, entering the aeronautical field as engineer in charge of research with the Clarke Thompson Research in Philadelphia, Pa. He was decorated as Knight of the Order of the Crown of Italy and in 1934 received the honorary DSc degree at Norwich University. He lives in Chevy Chase, Md.

'08 CE—George E. Sokolsky, writing in New York Herald Tribune, May 11, on "Some Fighting Consuls," recalls the late George C. Hanson, saying that he would probably have been a Coptic Emperor now, had he lived and gone to Ethiopia. Sokolsky recalls that in Harbin, where Hanson was American Consul General for years, "he was more an eleemosynary institution than a consul . . . had saved everybody's life and had bought everyone a dinner." Sokolsky intimates, from a conversation with Hanson in Washington after he was recalled from Harbin, that a double-crossing received in his own country, which "had no counterpart in all the tangled life he had led in the Far East," led finally to Hanson's suicide. He was appointed American Minister to Ethiopia, but then suddenly demoted to a "useless job" in Greece. On his way there, Hanson took his own life.

'08 C. E.—Frank A. Kristal is District Manager in New York City for the Weinman Pump Mfg. Co., of Columbus, Ohio, with offices at 30 Church St. He is the author of a series of articles on Centrifugal Pumps currently appearing in the magazine, "Power."

'35 M. E.—Jack Todd is working for the Carnegie Illinois Steel Corp., at the Homestead Steel Works, Munhall, Pa. He is on the observation corps, gathering data in the field to improve plant practice.

'35 M. E.—J. C. Walsh is assistant to the Chief Engineer, tool designing and trouble shooting, for the Die Molding Corp., Canastota. His address is 32 Bun St., Cazenovia.

'35—Richard L. Katzenstein is with the Bethlehem Shipbuilding Corp. Ltd. At present he is preparing to test some destroyers which will use 600-pound steam pressure exclusively; this is the first such installation in any navy in the world. After this he will be at work on the airplane carrier, the *USS Wasp,* and a dredge, the *USS Goethals.* Next year he expects to work on a battleship and on the largest floating drydock in the world. Dick is living at 238 Sea Street, Quincy, Mass.

'35 C.E.—Egbert P. Morgan is working on the stress analysis of the flight deck of the airplane carrier *Wasp.* It is estimated that it will take him and his six coworkers two years to complete the solution.

'35 M.E.—Hugh Mason is in the condenser department of the Ingersoll Rand Co. in New York City. J. F. Mitchell is in the sales department of the same company.

'36 AE—Frederick Pierce has a position with the York Ice Machinery Corporation in York, Pa.

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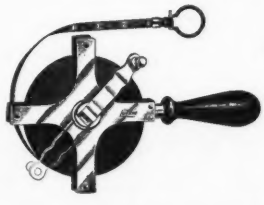

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Visitor: "What profession have you selected for your son?"

Farmer: "I'm going to educate him to be a lawyer. He's argumentative by nature and can't keep out of other people's business, and he might as well be paid for it."

* * *

Football Coach: "And remember that football develops individuality, initiative, and leadership. Now get in there and do exactly as I tell you."

* * *

They tell us that dogs fill empty spaces in men's lives. Probably they had hot dogs in mind.

* * *

"Going around with women sure keeps me young."

"How come?"

"I started going with them four years ago when I was a freshman and I'm still a freshman."

* * *

There was a young fellow named Oynce,
Who was prone to forget dec'mal points.
He designed a machine,
But it was soon seen
That it would be weak in the joints.
His sister—they called her Marie—
(A slide rule Sadie was she)
Cried, "I see what's wrong.
You've made it too long.
'Point six,' and not 'six,' it should be."

* * *

Many humorous stories come from the Mech Lab department, so here is the current one. In the course of running tests on one of the steam engines, the instructor, turned his back for a short time on the work being done, during which time someone managed to let the engine start to run away. Hearing the accident, imagine the instructor's surprise when he dashed for the header valve and found everyone gone but one student, who was standing placidly by. When the speed was again brought under control, and the other men returned, the lone student explained that he had been told in the electrical engineering school that when a motor started to run away there was no need of trying to duck because it would get you anyway.

* * *

"Don't cry, sonny, grandpa will play Indian with you".

B-but y-you won't d-do any good. Y-you're already scalped". —Penn Triangle

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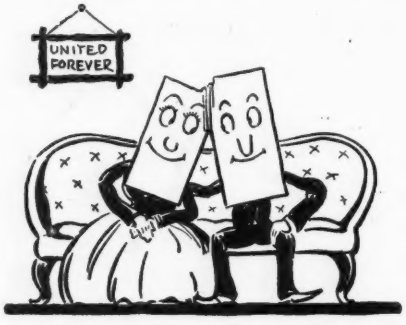
G-E *Campus News*

NUMBER 7000

JUST as if timed to take part in the 25th birthday celebration of the General Electric shops in Erie, Pa., Locomotive Number 7000 recently bowed its way out of its shed and took a brilliant turn on the test track.

The first of Number 7000's predecessors was begun in Erie in 1911, or just 25 years after electrical manufacture had commenced in Schenectady. Since that time locomotives weighing from 1½ to 300 tons have been turned out to improve haulage electrically. This range includes types for every sort of service—straight electric with trolley pole or third-rail shoe, battery types, internal-combustion engines, and combinations of different designs.

The Erie plant is notable for its contributions to practically every phase of modern electric transportation. The electrification of terminals and railroads has been accomplished largely with Erie equipment. Many of the new high-speed trains, which have aroused so much interest in rail travel, and many urban transit vehicles, such as street cars, trackless trolley coaches, and diesel-electric buses, likewise use Erie equipment.



FIFTY YEARS OF WELDED BLISS

TWO pieces of metal were joined in "weldlock" fifty years ago. That was in 1886, when Professor Elihu Thomson, one of America's greatest pioneers in the field of electrical science and co-founder of the General Electric Company, invented resistance welding—fusing metals by placing them in contact and passing an electric current through them.

To mark the golden anniversary and to honor the man who officiated at the "ceremony," the Detroit Section of the American Welding Society dedicated a recent program to Professor Thomson's invention.

The years have seen resistance welding develop from its purely experimental stage into a process of metal fabrication that is wide in application. Metal radio and industrial tubes and parts, automobile bodies, the high-strength aluminum alloys used in aircraft, farm implements, the new lightweight railway equipment—all are fabricated by resistance welding.

SUNSHINE IN MANHATTAN

AT last there is sunshine—sunshine for those who spend so much of their hurried lives in the shadows of Manhattan's financial district. For in his new downtown recreation and health center—largest of its kind in the world—Artie McGovern, famous trainer and physical director, has equipped both the hot room and gymnasium with ultraviolet sunlamps.

Installed by General Electric engineers in the form of 26 ceiling units—probably the largest installation ever made in a single location—they not only afford health-giving artificial sunshine but are the sole means of illuminating the two rooms.

This installation marks another step forward in the field of lighting. The development of better lamps to sell at greatly reduced prices, the campaign for safety on the highway by means of improved highway lighting, the "Better Light—Better Sight" movement for the protection of eyesight, and the search for methods to improve general health have all been given strong impetus through the efforts of the General Electric Company.

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